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(54) **Motion image indexing and search system**

System zur Indexierung und zum Suchen von bewegten Bildern

Système pour indexation et de recouvrement des images mobiles

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- **Proc. from Interchi 93, Conference on Human Factors in Computing Systems, 24-29 April 1993, page 525, Article by Ueda et al: "IMPACT: Interactive Motion Picture Authoring system for Creative Talent";**
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Description

Background of the Invention

Field of the Invention

[0001] The invention relates to a representative image display apparatus comprising a series of multiple images into which a motion image is formed, and which displays a representative image of each scene, and to a motion image search apparatus which executes searches for a motion image using the representative image display apparatus.

Description of Prior Art

[0002] Generally, a motion image contains multiple scenes. Each scene has independent meaning, and is defined by a group of consecutive images. Fig. 2 shows a situation where three scenes have been recorded on a video tape. Scene A is a view of a person, scene B is of a house, and scene C is of an automobile. Each scene respectively comprises two (A1 and A2), two (B1 and B2), and three (C1-C3) images. A motion image search apparatus is used to quickly select a required scene from a motion image on recorded media, such as video tapes, when editing motion image images such as those required in a multimedia presentation creation or in broadcasting. Recently, apparatus have been developed that display a representative image (hereinafter referred to as representative image) of each scene after a motion image has been partitioned into scene units, and that allow a desired scene to be selected using the representative image as an index.

Fig. 3 is a block diagram from a catalog for "Mediachef/CUT" by Hitachi, Ltd. showing a system using the product. Details of its operation are given in "Mediachef/CUT for Windows User Operation Manual" (Windows is a registered trademark).

In the figure, the system comprises a PC 2 which performs general control, a video playback apparatus 4 which provides the motion image to the PC 2, and a color printer 6 which prints the edited images. The PC 2 contains a video capture board 8 which captures and digitizes images provided from a video playback apparatus 4. This configuration performs, for example, the following steps.

(1) First the motion image to be processed is loaded, (2) a transition point in the scene is automatically identified based on the degree of color change in the images, (3) an image is decided to be a representative image that appears immediately after the transition point is observed, and (4) the representative image is stored or printed as an index for each scene. In the case of Fig. 2, a scene transition point is identified between A2 and B1, and between B2 and C1, and the leading images of each scene, B1 and C1, become the representative images.

[0003] This system helps the user in tape editing, for example, by printing out the representative images contained in one video tape cassette in a small sheet and affixing the sheet to the side of the video tape cassette. In addition, editing processes such as sorting, deletion, and trimming of the scenes are possible on the PC 2.

[0004] In the system described above, referencing the representative images allows the user to look for desired scenes and replay them, that is, to search for a motion image. However, in representative images where a ship is afloat on the ocean, for example, the direction of the ship's movement can only be determined by replaying the motion image. If several representative images of this sort exist, for example, when searching for pictures where the ship moves to the right, the user must check each scene containing the representative image one by one. This manual search is not only laborious when there are a large number of similar representative images, but inconvenient when one tries to grasp the general movement of a motion image, and leaves much room for improvement for efficient editing.

[0005] Proc. from Interchi' 93, Conference on Human Factors in Computing Systems, 24 April 1993, page 525, Article by Ueda et al: "IMPACT: Interactive Motion-Picture Authoring System for Creative Talent" already discloses a representative image display apparatus which comprises: an image input section for inputting and storing a motion image comprising a sequence of multiple images; a scene partition section for analyzing the input motion image, detecting transition points in the scenes, and partitioning the motion image into scenes; a representative image selection section for selecting a proper image from the motion image and setting it as a representative image; a motion decription image creation section which detects the characteristics of the movement of the filmed object or the camera work (zooming and panning); a change information hold section for associating and holding the information related to the motion description image for each schene; and a display control section for displaying the representative image of the scene with its associated change information. Specifically, a representative image is selected for each cut of the motion picture and arranged in a time sequence order, and classification of each cut is represented by an arrow as the motion description image. More specifically, a motion is classified into patterns, and the directions, colors and the like of the arrows are changed based on the classification.

Summary of the Invention

[0006] It is the object of the present invention to provide a representative image display apparatus and a motion image search apparatus, that enable the user to easily and intuitively grasp the contents of a motion image.

[0007] This object according to the invention is solved for the representative image display apparatus by the

features of claim 1 and for the motion image search apparatus by the features of claim 4. Preferred embodiments of the representative image display apparatus are defined in claims 2 and 3.

[0008] The representative image display apparatus of the invention includes an image input section which inputs and stores a motion image comprising a sequence of multiple images, a scene partition section which analyzes the input motion image, detects scene transition points, and partitions the motion image into scenes, a representative image selection section which selects a proper image as the representative image from among the images comprising each scene, a motion description image creation section which creates an image visually showing the movement of an object based on a difference among a plurality of images, a change information hold section which associates and holds the information related to the motion description image for each scene with the representative image of the scene, and a display control section which combines and displays the representative image of at least one scene with its associated change information.

[0009] In this configuration, the motion image which was input into the apparatus is first stored by the image input section. Next, the motion image is read, its scene transition points detected, and it is partitioned into scenes. Then, both a representative image of each scene is created and the information on changes occurring in an object in every scene is associated and held with the representative image of the corresponding scene. Finally, a representative image of at least one scene and the change information that was associated with the representative image are combined and displayed. Thus, the movement of an object can easily be grasped.

[0010] Naturally, the "movement of the object" may occur as a result of movement at the camera. A "difference" between images is determined, for example, by obtaining the difference in pixel values at corresponding locations.

[0011] Further, the above motion description image creation section fetches, at a preset time interval, the image stored in the image input section and creates its outline image. The outline image is then superimposed onto a previously created motion description image so as to create a new motion description image, and the fetch, the creation of the outline image and the superimposition processes are repeated to create new motion description images in succession. The "preset time interval" can be specified from an external source or can be the default value of the apparatus. in this aspect, the outline images at the various times are all shown in one image. Only the outline image that was created first may be used without change as a motion description image.

[0012] Accordingly it is even easier to grasp the movement.

[0013] Further, when creating outline images at preset time intervals, the above motion description image creation section creates new motion description images while changing the colors of the outlines based on the elapsed time from a scene's start time. Here "color" includes black, white, and neutral tints (or achromatic shades).

[0014] Thus, not only the movement but also the direction of movement can be easily grasped.

[0015] In another embodiment of the invention, when an arbitrary time between the scene start time and end time is specified, the above display control section highlights the location of the object at the specified time in the above motion description image. Since the "location of the subject" is indicated from the outline image, one application of the aspect is to change the intensity of outline image that corresponds to the specified time.

[0016] According to this embodiment, it becomes easy to grasp the location of the object at a certain time, and this can facilitate the search for the search start position.

[0017] The motion image search apparatus of the invention performs searches for motion image and includes one of the above representative display apparatus, a video source which plays back and supplies a motion image to the above representative display apparatus, a video source control section which controls the playback of the motion image by the video source, and a command input section which inputs commands for search processing. In this configuration, when one scene and a playback start time from the displayed scenes are specified by the command, the video source control section follows the command and performs playback of the motion image from the above playback start time of the specified scene. The playback enables the user to confirm the search result. According to the motion image search apparatus of the invention, all the advantages of the above representative image display apparatus are obtainable and the motion image editing efficiency is greatly improved.

Brief Description of the Drawings

[0018]

Fig. 1 is an overall block diagram of the motion image search apparatus concerning embodiment 1.

Fig. 2 exemplifies a state where three scenes have been recorded on video tape.

Fig. 3 is a block diagram, taken from a catalog for Mediachef/CUT, of a system using "Mediachef/CUT".

Fig. 4 is a block diagram of motion description image creation section 123 of embodiment 1.

Fig. 5 is a flowchart showing the flow of processes executed by the motion description creation section 123 of embodiment 1.

Fig. 6 shows a UI which is displayed at display section 104 of embodiment 1.

Fig. 7 is a flowchart showing the flow of processes

which use the UI of Fig. 6.

Fig. 8 is an enlargement of the motion description image display area included in Fig. 6.

Fig. 9 is a block diagram of a motion description image creation section of embodiment 2.

Fig. 10 is a flowchart showing the flow of processes executed by the motion description image creation section 123 of embodiment 2.

Fig. 11 shows a result obtained when the motion description image of Fig. 8 is recreated by the apparatus of embodiment 2.

Fig. 12 is a block diagram of a catalog creation section 120 of embodiment 3.

Fig. 13 is a block diagram of a catalog storage section 130 of embodiment 3.

Fig. 14 shows the UI which is displayed at display section 104 of embodiment 3.

Description of Preferred Embodiments

[0019] Here, preferred embodiments of a representative image display apparatus and a motion image search apparatus incorporating the representative image display apparatus are described.

This description will also clarify the representative image display method of the invention. In the motion image search apparatus described in the embodiments below, a playback apparatus which plays back a video medium is included, and the playback apparatus is electrically controlled directly from a main control section in the motion image search apparatus. Although this configuration is ideal, for example, in broadcasting where relatively advanced functions are required, its applications are of course not limited thereto.

Embodiment 1

[0020] In this embodiment, an apparatus is described which creates an image showing the motion of an object in every scene and displays it together with a representative image.

Configuration

[0021] Fig. 1 is an overall block diagram of the motion image search apparatus concerning this embodiment. Since a main control section 110 controls the overall apparatus in this figure, this and a command input section 103 mentioned later correspond to the representative image display apparatus. A video source 101 plays back recorded video media such as those for VCRs and provides motion image to the main control section 110 and a motion image display section 102. The main control section 110 creates representative images and the motion description images from the provided motion image, and motion image display section 102 simply displays the provided motion image. The motion image display section 102, for example, a monitor which displays ordinary NTSC format signals, allows a user to directly view the searched motion image.

A video source control section 112 controls the playback of motion image from a video source 101. It performs control functions required for the search process, such as "stop after 10 seconds from the start", in addition to the various control functions (tape rewind, fast forward, pause, and so forth) available on the front panel of home VCRs. Control signals are connected to the video source 101 by a cable. A video source control section 112 controls the playback of the motion image that is necessary for the main control section 110 to create a representative image, and necessary for the motion display section 102 to display.

The played back motion image is input by an image input section 111. Image input section 111 includes an A/D converter and a frame memory (not shown). Image input section 111 digitizes the input image, stores it into the frame memory and waits for further processing. The image input section 111 may also contain a disk storage apparatus which secondarily stores the contents of the frame memory.

In this case, it becomes unnecessary to read the motion image required for processing every time from video source 101, and processing efficiency can be improved.

A catalog creation section 120 is composed of a series of software modules which read image data from the frame memory, and creates a catalog based on this data, and which comprises a scene partition section 121, a representative image selection section 122, and a motion description image creation section 123. A catalog is a list of information concerning multiple scenes. On the other hand, based on the contents of the data output from the catalog creation section 120, a catalog storage section 130 sorts and stores the data, and comprises a scene partition data storage section 131, a representative image storage section 132, and a motion description image storage section 133.

The scene partition section 121 analyzes the digitized image using known methods and partitions the motion image into scenes based on the difference between two consecutive scenes. Based on the position (for example a time code or counter value such as LTC or VITC recorded on a tape) on the medium at the partition point, the start point and end point of each scene are stored in a scene partition data storage section 131.

The representative image selection section 122 selects a certain frame from the scene as a representative image. The representative image may be a frame at the beginning, middle, or end of the scene, or a frame specified by the user. To identify the scene which the representative image represents, information such a scene number is stored into the representative image storage section 132.

Motion description image creation section 123 performs a distinctive process in this embodiment. Fig. 4 is a block diagram of a motion description image creation section 123.

In this figure, an outline image creation section 201 processes the input image and creates an outline image. A composite image creation section 202 performs composite processing on the created outline image and an outline image storage section 203 temporarily stores the composed outline image. In this embodiment, the outline of an object included in a given image within a scene is sampled in each image, and these outlines are superimposed to create one image.

Command input section 103 permits the entry of command inputs by the user and employs a device such as a keyboard, mouse, or various pointing devices. The input command is processed by an input management section 113, which is a command dispatcher, to initiate the required action within the main control section 110.

A display control section 114 includes a system program for the display system which centrally controls the display of various images such as representative images and motion description images, and a display circuit such as a VGA controller and its driver. In the display control section 114, the display state such as for the location of a catalog which is read from catalog storage section 130 is ultimately determined and displayed at a display section 104. The display section 104 may be an ordinary display apparatus on which representative images and motion description images are displayed.

Process Operations

[0022] The main control section 110, which receives a scene partition start instruction based on command inputs, issues a play-back instruction to the video source 101 through the video source control section 112. The motion image output from video source 101 is displayed by the motion image display section 102 and digitized in frame units by the image input section 111.

Next, each frame is sent to a catalog creation section 120. At the scene partition section 121, a histogram is taken for the input image and its preceding image, and a scene's partition point is judged when the absolute value of its difference reaches or exceeds a threshold. This method itself is known. Instead of this method, any characteristic physical parameter between consecutive images may be compared to detect the partition point. Once the partition point is ascertained, information such as a time code recorded on the video tape is acquired from the video source 101 and stored in the scene partition data storage section 131. In parallel with this, a representative image is created and stored as a still image file in the representative image storage section 132. Next, the motion description image is created.

Fig. 5 is a flowchart showing the flow of processes by motion description image creation section 123. According to this figure, the sent image is passed through a Compass-gradient filter in the outline image creation section 201 and an outline image is created (S211). In the outline image, each pixel takes on one of two values 0 and 1, where pixels on the outline become 1 and other pixels become 0. Outline images may be obtained at a user specified frame interval, for example, every 10 frames, or at an interval preset as a default value in the apparatus.

Next, the image which has been stored in the outline image storage section 203 is read and composed (S212) by the composite image creation section 202 with the outline image created in S211. Composing of the image is achieved by taking the logical OR of pixel values at the same coordinates for all pixels in the two images. The composite image thus created is stored (S213) in the outline image storage section 203. These processes are repeated until a scene partition point is detected. When the scene partition point is detected, the image stored in the outline image storage section 203 is transferred to and stored in the motion description image storage section 133.

Here, the above processes are described together with user input operations and actual image display examples.

Fig. 6 shows a user interface (UI) displayed by the display section 104, and Fig. 7 is a flowchart showing the flow of processes using the UI. In Fig. 6, a scene partition start button 152 starts scene partition. A playback button 153 initiates playback of the motion image for the selected scene and a stop button 154 stops the motion image being played back. In Fig. 6, the entire screen above these buttons is a catalog display area 151 which is organized into 3 scene display areas 155, each corresponding to one scene. Each scene display area 155 contains a representative image display area 156 which displays the representative image of that scene, a motion description image display area 157 which displays the motion description image, and a scene partition data display area 158 which displays each scene's start point (start time) and end point (end time). The first two digits of the time display indicate the hours, followed by minutes, seconds, and frame number. The frame number for the NTSC format is from 0 to 29 since the number of frames displayed is 30 per second. When playing back a motion image, the user is allowed to specify beforehand how much to play back (that is, for how much of the motion image scene partition is to be performed). This specified amount is converted to a time code on the medium and held in the apparatus as the specified end position.

In the UI, once the user presses the scene partition start button 152, the input management section 113 interprets this command (S170) and a playback instruction (S171) is sent to the video source 101. The medium in the video source 101 is played back (S172) and the motion image is sent (S173) to the catalog creation section 120. At this time, it is judged whether the time code on the medium indicates the specified end position (S174) or the status indicates the end position (S175) of the medium, and if either is realized the process ends (S176).

If the process does not end (No at S175), an outline im-

age for that frame is created and a motion description image is created (S177). In parallel with this, the input image is judged (S178) as to whether it should be a representative image, and a representative image is created (S179), for example, when a frame specified beforehand by the user is to be processed.

Next, it is judged (S180) whether the scene partition point is reached, and if it is, the motion description image is transferred (S182) to the motion description image storage section 132, and catalog display information is created (S183) to display (S184) scene partition data, the representative image, and the motion description image. Then the process ends. If the scene partition point is not reached, the next frame is read and the same process is repeated.

From the steps above, a scene's representative image and motion description image are displayed on a display apparatus. An enlarged diagram of the motion description image display area included in Fig. 6 is shown in Fig. 8, where the movement of the object extending over multiple images is expressed consecutively in one image. As a result, the user can understand the scene in general from the representative image, and in detail from the motion description image. Based on these types of information, the user can actually view the scene by selecting it on the screen, by using a mouse, for example. As shown in Fig. 6, the selected scene has its area frame highlighted. The above buttons become effective for the selected scene. That is, the playback button 153 enables playback of the scene and the stop button 154 enables playback to be stopped. In this manner, a highly efficient motion image search is achieved. The above is an overview of the embodiment. Possible improvements and variations for this embodiment are discussed in the following.

(1) Display the motion description information as characters, symbols, and so forth.

Instead of using a motion description image, the direction of movement of the subject can be expressed using characters such as "right" and "up", or using symbols such as "→" and "↑". This can be achieved by judging the angle of the subject's movement vector. When expressing movement using characters, symbols, and so forth, the processing time and memory capacity required for the image creation can be reduced.

(2) Display the transition information other than movement

When, for example, the object is a neon sign, the object itself does not move but its color changes. In this case, examining such differences as color or brightness in the object before and after the change allow information such as "becomes red", "becomes white", or "becomes bright" to be displayed as text data beside the representative image.

Embodiment 2

[0023] Although the motion description image was created in embodiment 1 by superimposing successive outline images, the superimposition in embodiment 2 is performed while varying the color of the outline image. For this reason, if the outline image concerning a subsequently input frame is displayed using a darker color, for example, it becomes easier to grasp the movement of the display.

Fig. 9 is a block diagram of the motion description image creation section 123 in this embodiment. The difference between this figure and Fig. 4 is that a hue setting section 301 is added. Hue setting section 301 varies the hue of the outline image with the lapse of time.

Fig. 10 is a flowchart showing the flow of processes executed by the motion description image creation section 123. The difference between this figure and Fig. 5 is that S312 is inserted after S211. That is, after an outline image is created (S211), the outline's hue is varied (S312) by the hue setting section 301 with the lapse of time from the start time of the scene. After this, the process is repeated as shown in Fig. 5 and the motion description image is created. Gradation processing in which only the brightness is decreased can be employed in the processing of hue setting section 301. In this case, the outline pixel values for the outline image obtained the first time are set to a maximum value of 255 on an 8-bit gray scale and decreased by 5 at a time, for example, in subsequently input images. Fig. 11 is an image obtained as a result of re-creating the motion description image of Fig. 8 using the apparatus of this embodiment, and it becomes easier to grasp the movement of the subject.

Embodiment 3

[0024] In this embodiment, the input of an arbitrary time between the start time and end time of a scene highlights the outline image corresponding to the input time (hereinafter referred to as specified time) in the motion description image for the scene. Furthermore, the medium is actually forwarded or reversed until the position where the image corresponding to the specified time is found.

Fig. 12 is a block diagram of a catalog creation section 120 in this embodiment and Fig. 13 is a block diagram of a catalog storage section 130. A new block added in Fig. 12 is a time calculation section 401 which obtains the amount of change in time occurring when a time button described later is pressed after the specified time was input for a scene.

On the other hand, a new block in Fig. 13 is a time storage section 411 which stores, for every scene, the time calculated by the time calculation section 401. The time storage section 411 is a buffer which can store at least one time value for every scene, and is useful when a search temporarily moves to another scene and then re-

turns back to the original scene, so that the user can determine which image had been referenced previously. Fig. 14 shows the UI displayed by the display section 104. The difference between this figure and Fig. 6 is that a display of "current time" is newly added. When a specified time is input, the current time is initialized with this value. Subsequently, every time a time button is pressed, the current time increases or decreases. Time buttons comprise a previous time button 451 which specifies a previous time and a subsequent time button 452 which specifies a subsequent time.

Using the configuration above, the user first selects a scene. Here, the topmost scene is selected. Next, the specified time is entered, for example, through a keyboard. In the figure, the allowable input is in the range of scene start time 00:00:00:00 to end time 00:02:05:20. For example, when 00:01:02:28 is specified, the outline image with the closest time is highlighted. Images are input in 1/30 second units, and when an outline image is created for every image, for example, the time corresponding to the outline image (called an outline image time) takes on a discrete value in 1/15 second units. For this reason, the specified time and the outline image time usually do not match exactly, so the closest time is selected. The selected outline image time is stored in a time storage section 411.

In this embodiment, along with highlighting the outline image, the playback position of the actual medium is forwarded or rewound to the outline image time. Thus, the object on the medium appears at the position of the highlighted outline image. As a result, the user can see where the object is located at the specified time, and if playback from that position is desired, this can be achieved simply by issuing a playback instruction.

When the position at the specified time is different from where playback is to start, the above time buttons are pressed. The pressing of the button is judged by the input management section 113 and a new current time is calculated by the time calculation section 401. Since the outline image time takes on a discrete value in 1/15 second units, the current time increases or decreases by 1/15 second each time the button is pressed, and the outline image adjacent to the currently highlighted outline image is highlighted. The playback position on the medium is also precisely adjusted.

The contents of time storage section 411 are updated with the new current time. From the processes above, it becomes possible to set the start position of playback with extremely high precision. If the subsequent time button 452 is pressed at the final outline image time of the scene, or conversely, if the previous time button 451 is pressed at the initial outline image time, these instructions will be ignored.

In this embodiment, it is necessary to consider that the motion description image is only one image. That is, once this image is created, it becomes necessary to add information to the motion description image regarding which outline corresponds to what time. For this reason, (1) motion description images having differing levels of brightness according to preset times are created using the method of embodiment 2, (2) the correspondence between the various levels of brightness and times is established, (3) the pixels having the brightness corresponding to the current time are scanned in the motion description image, and (4) all matching pixels are highlighted. The result of these steps is that only the desired outline stands out.

While there have been described what are at present considered to be preferred embodiments of the invention, it will be understood that various modifications may be made thereto, and it is intended that the appended claims cover all such modifications.

Claims

1. A representative image display apparatus comprising:

   an image input section (111) for inputting and storing a motion image comprising a sequence of multiple images,
   a scene partition section (121) for analyzing the input motion image, detecting transition points in the scenes, and partitioning the motion image into scenes,
   a representative image selecting section (122) for selecting a proper image from the motion image comprising multiple scenes and setting it as a representative image,
   a motion description image creation section (123) which creates an image visually showing the movement of an object and fetches, at a preset time interval, the image stored in the image input section (111) and creates its outline image, and superimposes the outline image onto a previously created motion description image to repeatedly create a new motion description image,
   a change information hold section (130) for associating and holding the information related to the motion description image for each scene with the representative image of said scene, and
   a display control section (114) for combining and displaying, for at least one scene, the representative image of the scene with its associated change information, **characterised in that**

   said motion description image creation section (123) creates new motion description images while changing colors of the outlines based on the elapsed time from the start time of the scene.

2. The representative image display apparatus ac-

cording to claim 1, wherein said display control section (114) highlights the position of an object in a motion description image at a specified time, when an arbitrary time is specified between the start time and end time of a scene.

3. The representative image display apparatus according to claim 2, wherein said display control section (114) scans for pixels having a color corresponding to the given time, and highlights the location of the object in a motion description image by changing the color of all the pixels found by scanning.

4. A motion image search apparatus for performing searches for a motion image, comprising:

the representative image display apparatus according to one of claims 1 to 3,
a video source (101) for playing back and supplying a motion image to said representative image display apparatus,
a video source control section (112) for controlling the playback of the motion image from the video source, and
a command input section (103) for inputting commands for search processing,

wherein the video source control section (112) performs, when one scene from displayed scenes and a playback start time for the scene are specified by a command, playback of the motion image from the playback start time of the scene based on the command.

Patentansprüche

1. Darstellungsvorrichtung für repräsentative Bilder, welche aufweist:

einen Bildeingabeabschnitt (111) zur Aufnahme und Speicherung eines bewegten Bildes mit einer Folge von mehreren Bildern,
einen Szenenteilungsabschnitt (121) zum Analysieren des eingegebenen bewegten Bildes, Erfassen von Übergangspunkten in den Szenen und Teilen des bewegten Bildes in Szenen,
einen Auswahlabschnitt (122) für repräsentative Bilder zur Auswahl eines geeigneten Bildes aus dem bewegten Bild mit mehreren Szenen und zum Setzen von diesem als ein repräsentatives Bild, einen Bewegungsbeschreibungs-Bildschaffungsabschnitt (123), welcher ein Bild schafft, das visuell die Bewegung eines Gegenstands zeigt, und in einem voreingestellten Zeitintervall das in dem Bildeingabeabschnitt (111) gespeicherte Bild holt und sein Umrissbild schafft, und das Umrissbild über ein vorher geschaffenes Bewegungsbeschreibungsbild überlagert, um wiederholt ein neues Bewegungsbeschreibungsbild zu schaffen,
einen Änderungsinformations-Halteabschnitt (130) zum Assoziieren und Halten der Informationen, die auf das Bewegungsbeschreibungsbild für jede Szene mit dem repräsentativen Bild der besagten Szene bezogen sind, und
einen Darstellungssteuerabschnitt (114) zum Kombinieren und Darstellen des repräsentativen Bildes der Szene mit seinen assoziierten Änderungsinformationen für wenigstens eine Szene,

dadurch gekennzeichnet, dass
der Bewegungsbeschreibungsbild-Schaffungsabschnitt (123) neue Bewegungsbeschreibungsbilder schafft, während Farben der Umrisse auf der Grundlage der von der Startzeit der Szene verstrichenen Zeit geändert werden.

2. Darstellungsvorrichtung für repräsentative Bilder nach Anspruch 1, worin der Darstellungssteuerabschnitt (114) die Position eines Gegenstands in einem Bewegungsbeschreibungsbild zu einer bestimmten Zeit hervorhebt, wenn eine beliebige Zeit zwischen der Startzeit und der Endzeit einer Szene spezifiziert ist.

3. Darstellungsvorrichtung für repräsentative Bilder nach Anspruch 2, worin der Darstellungssteuerabschnitt (114) nach Pixeln mit einer Farbe entsprechend einer gegebenen Zeit abtastet und den Ort des Gegenstands in einem Bewegungsbeschreibungsbild hervorhebt durch Änderung der Farbe aller durch Abtastung gefundener Pixel.

4. Bewegungsbild-Suchvorrichtung zur Durchführung einer Suche nach einem Bewegungsbild, welche aufweist:

die Darstellungsvorrichtung für repräsentative Bilder nach einem der Ansprüche 1 bis 3,
eine Videoquelle (101) zur Wiedergabe und Lieferung eines Bewegungsbildes zu der Darstellungsvorrichtung für repräsentative Bilder,
einen Videoquellen-Steuerabschnitt (112) zur Steuerung der Wiedergabe des Bewegungsbildes von der Videoquelle, und
einen Befehlseingabeabschnitt (103) zur Eingabe von Befehlen für die Suchverarbeitung,

worin der Videoquellen-Steuerabschnitt (112), wenn eine Szene aus dargestellten Szenen und eine Wiedergabe-Startzeit für die Szene durch einen Befehl spezifiziert sind, die Wiedergabe des Bewegungsbildes von der Wiedergabe-Startzeit der Sze-

ne an auf der Grundlage des Befehls durchführt.

Revendications

1. Système d'affichage d'images représentatives comprenant :

   - une section d'entrée d'images (111) pour entrer et stocker une image mobile comprenant une séquence d'images multiples,
   - une section de division de scènes (121) pour analyser l'image mobile entrée, détecter les points de transition dans les scènes, et diviser l'image mobile en scènes,
   - une section de sélection d'images représentatives (122) pour sélectionner une image correcte à partir de l'image mobile comprenant des scènes multiples et la définir en tant qu'image représentative,
   - une section de création d'images de description du mouvement (123) qui crée une image représentant, de manière visuelle, le mouvement d'un objet et extrait, à un intervalle de temps prédéfini, l'image stockée dans la section d'entrée d'images (111) et crée son image de contour, et superpose l'image de contour sur une image de description du mouvement créée précédemment pour créer, de manière répétée, une nouvelle image de description du mouvement,
   - une section conservant les informations de changement (130) pour associer et conserver les informations liées à l'image de description du mouvement pour chaque scène avec l'image représentative de ladite scène, et une section de commande de l'affichage (114) pour combiner et afficher, pour au moins une scène, l'image représentative de la scène et ses informations de changement associées, **caractérisé en ce que**
   - ladite section de création d'images de description du mouvement (123) crée de nouvelles images de description du mouvement tout en modifiant les couleurs des contours sur la base du temps écoulé depuis le début de la scène.

2. Système d'affichage d'images représentatives selon la revendication 1, dans lequel ladite section de commande de l'affichage (114) met en évidence la position d'un objet d'une image de description du mouvement à un instant spécifié, lorsqu'un instant arbitraire est spécifié entre le début et la fin d'une scène.

3. Système d'affiche d'images représentatives selon la revendication 2, dans lequel ladite section de commande de l'affichage (114) recherche, à l'aide d'un balayage, les pixels présentant une couleur correspondant à l'instant donné, et met en évidence l'emplacement de l'objet d'une image de description du mouvement en modifiant la couleur de tous les pixels repérés lors du balayage.

4. Système de recherche d'images mobiles pour effectuer des recherches sur une image mobile, comprenant :

   - le système d'affichage d'images représentatives selon l'une quelconque des revendications 1 à 3,
   - une source vidéo (101) pour relire et délivrer une image mobile audit système d'affichage d'images représentatives,
   - une section de commande de la source vidéo (112) pour commander la reproduction de l'image mobile à partir de la source vidéo, et
   - une section d'entrée d'instructions (103) pour entrer les instructions destinées à ce traitement de recherche, dans lequel
   - la section de commande de la source vidéo (112) réalise, lorsqu'une scène parmi les scènes affichées et un temps de début de lecture pour la scène sont spécifiés par une instruction, une lecture de l'image mobile à partir du temps de début de la lecture de la scène sur la base de l'instruction.

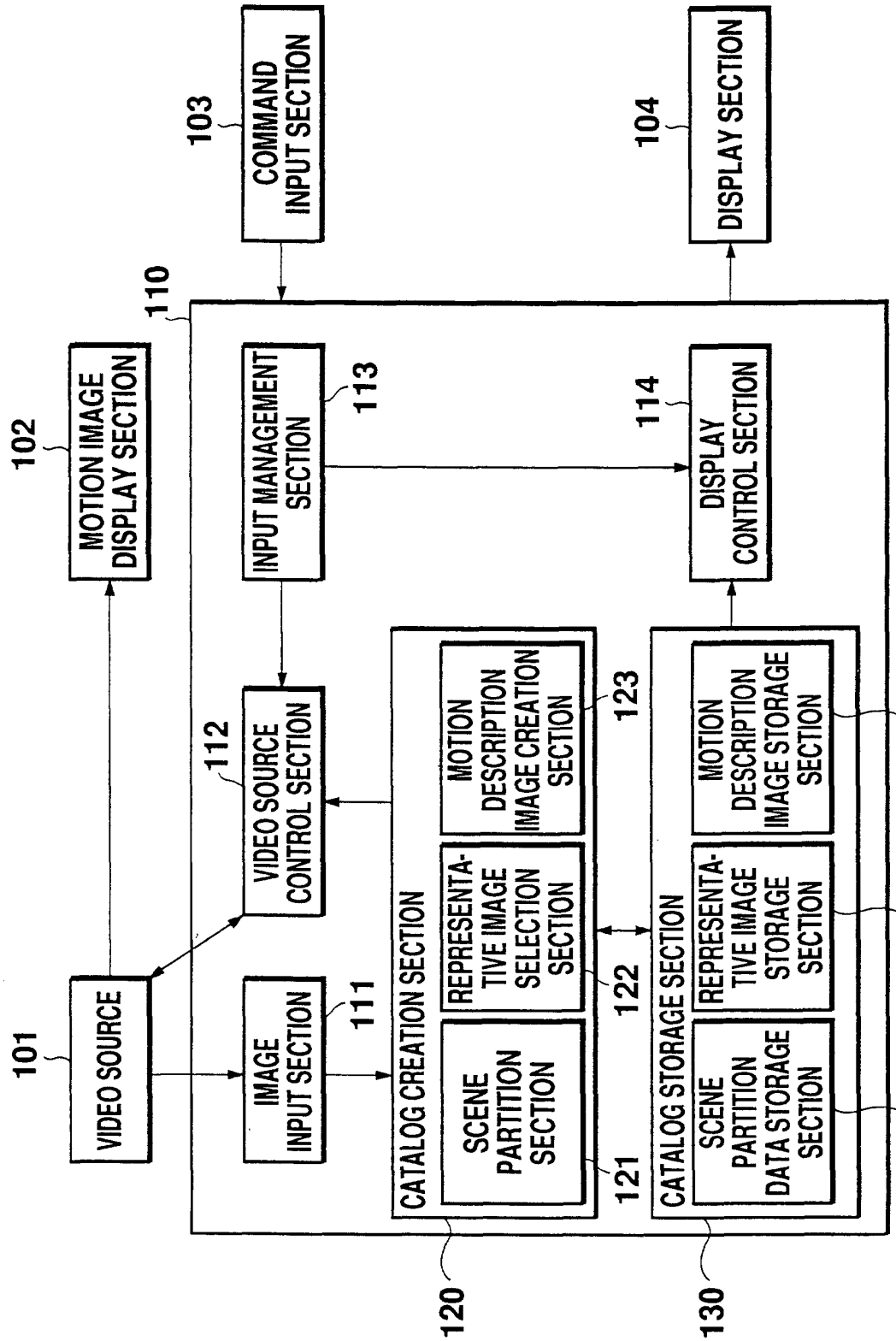
101
VIDEO SOURCE
102
MOTION IMAGE DISPLAY SECTION
103
COMMAND INPUT SECTION
104
DISPLAY SECTION
110
111
IMAGE INPUT SECTION
112
VIDEO SOURCE CONTROL SECTION
113
INPUT MANAGEMENT SECTION
114
DISPLAY CONTROL SECTION
120
CATALOG CREATION SECTION
121
SCENE PARTITION SECTION
122
REPRESENTATIVE IMAGE SELECTION SECTION
123
MOTION DESCRIPTION IMAGE CREATION SECTION
130
CATALOG STORAGE SECTION
131
SCENE PARTITION DATA STORAGE SECTION
132
REPRESENTATIVE IMAGE STORAGE SECTION
133
MOTION DESCRIPTION IMAGE STORAGE SECTION

Fig. 1

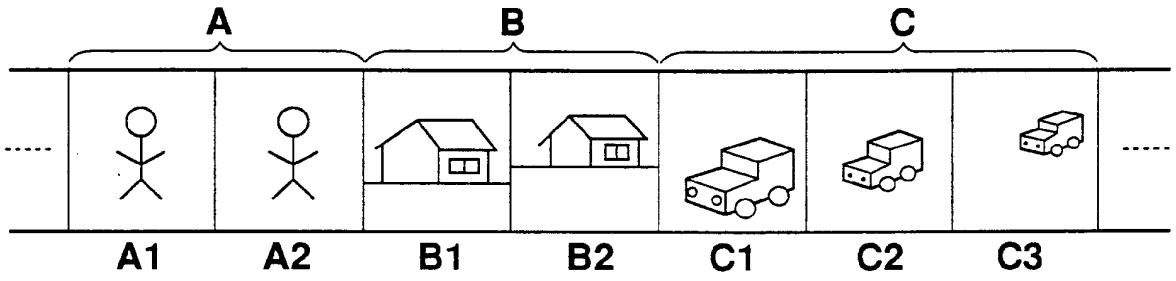
A
B
C
A1
A2
B1
B2
C1
C2
C3

Fig. 2

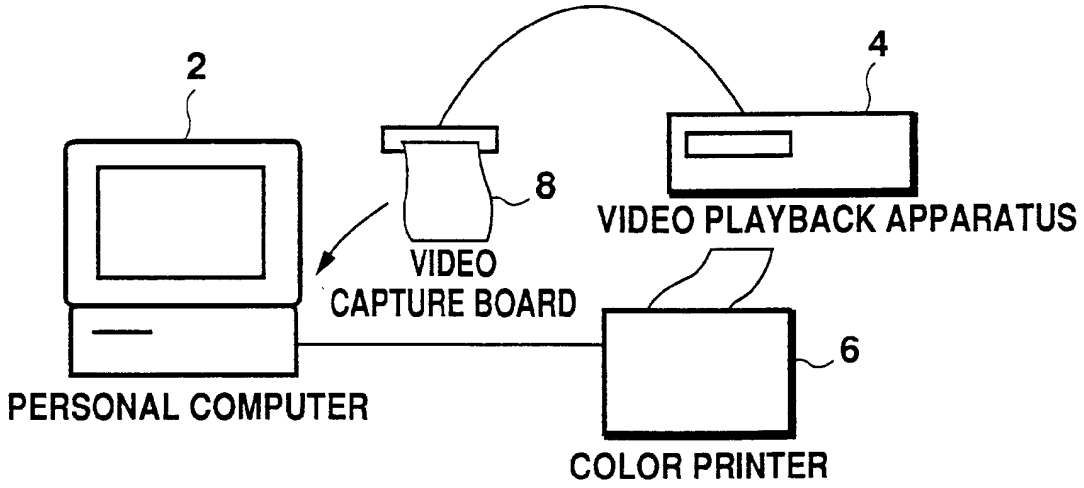
2
4
8
VIDEO PLAYBACK APPARATUS
VIDEO
CAPTURE BOARD
6
PERSONAL COMPUTER
COLOR PRINTER

Fig. 3

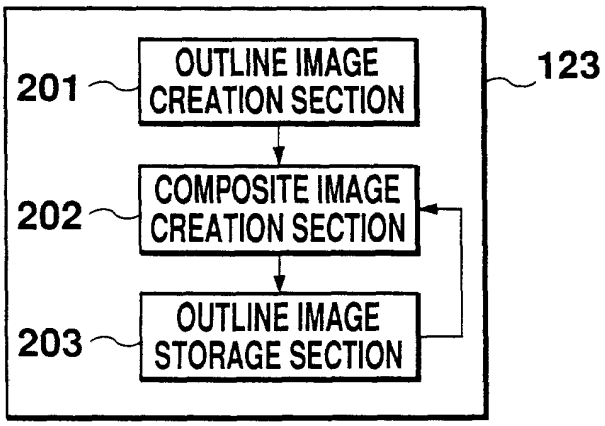
OUTLINE IMAGE CREATION SECTION
201
COMPOSITE IMAGE CREATION SECTION
202
OUTLINE IMAGE STORAGE SECTION
203
123

Fig. 4

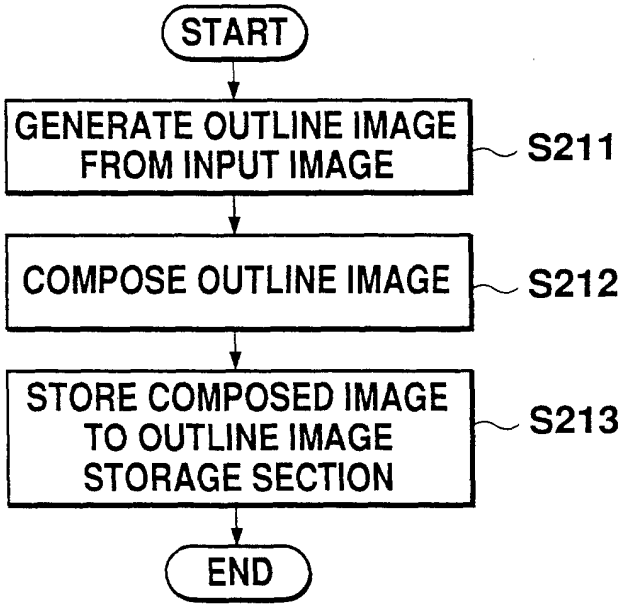
START
GENERATE OUTLINE IMAGE FROM INPUT IMAGE
S211
COMPOSE OUTLINE IMAGE
S212
STORE COMPOSED IMAGE TO OUTLINE IMAGE STORAGE SECTION
S213
END

Fig. 5

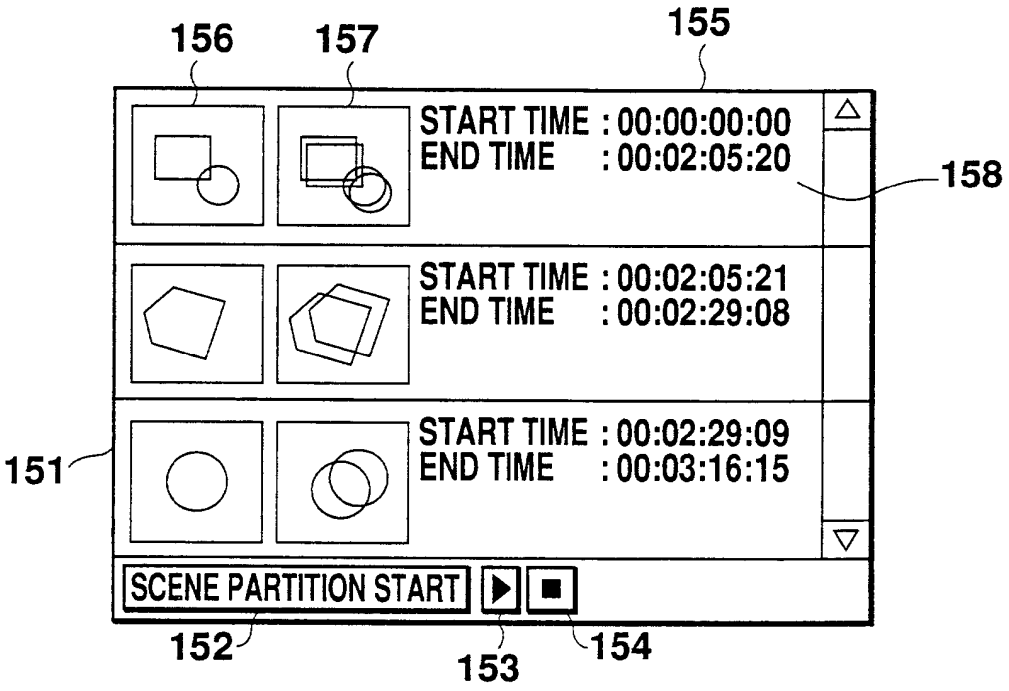
156
157
155
START TIME : 00:00:00:00
END TIME : 00:02:05:20
158
START TIME : 00:02:05:21
END TIME : 00:02:29:08
START TIME : 00:02:29:09
END TIME : 00:03:16:15
151
SCENE PARTITION START
152
153
154

Fig. 6

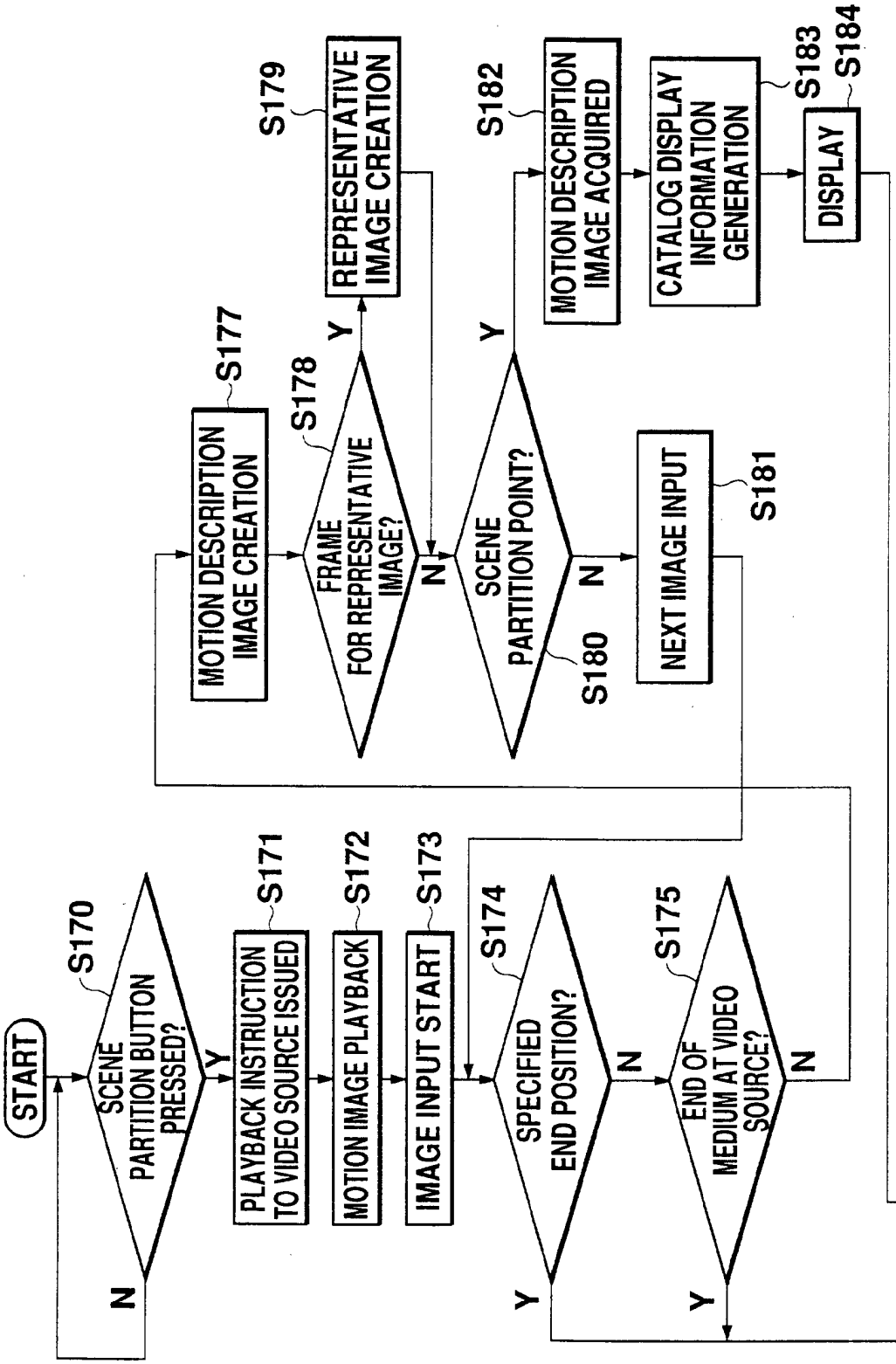
START
S170
SCENE PARTITION BUTTON PRESSED?
Y
N
S171
PLAYBACK INSTRUCTION TO VIDEO SOURCE ISSUED
S172
MOTION IMAGE PLAYBACK
S173
IMAGE INPUT START
S174
SPECIFIED END POSITION?
N
Y
S175
END OF MEDIUM AT VIDEO SOURCE?
N
Y
S176
END
S177
MOTION DESCRIPTION IMAGE CREATION
S178
FRAME FOR REPRESENTATIVE IMAGE?
Y
N
S179
REPRESENTATIVE IMAGE CREATION
S180
SCENE PARTITION POINT?
Y
N
S181
NEXT IMAGE INPUT
S182
MOTION DESCRIPTION IMAGE ACQUIRED
S183
CATALOG DISPLAY INFORMATION GENERATION
S184
DISPLAY

Fig. 7

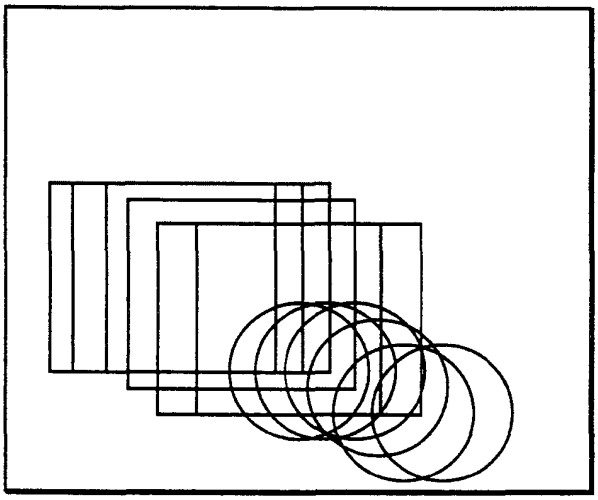

Fig. 8

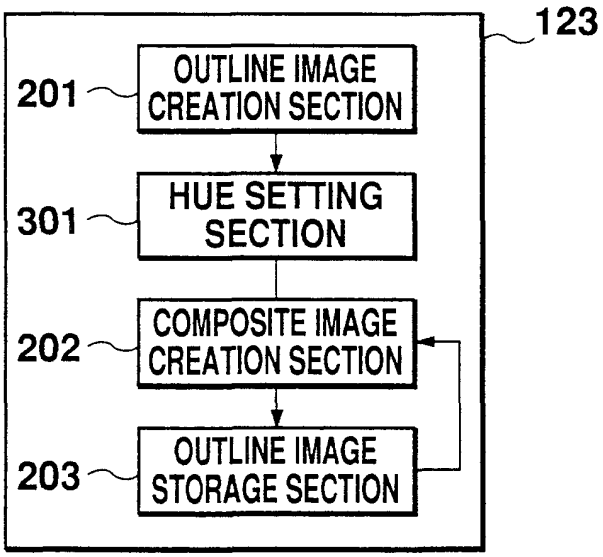
123
201
OUTLINE IMAGE CREATION SECTION
301
HUE SETTING SECTION
202
COMPOSITE IMAGE CREATION SECTION
203
OUTLINE IMAGE STORAGE SECTION

Fig. 9

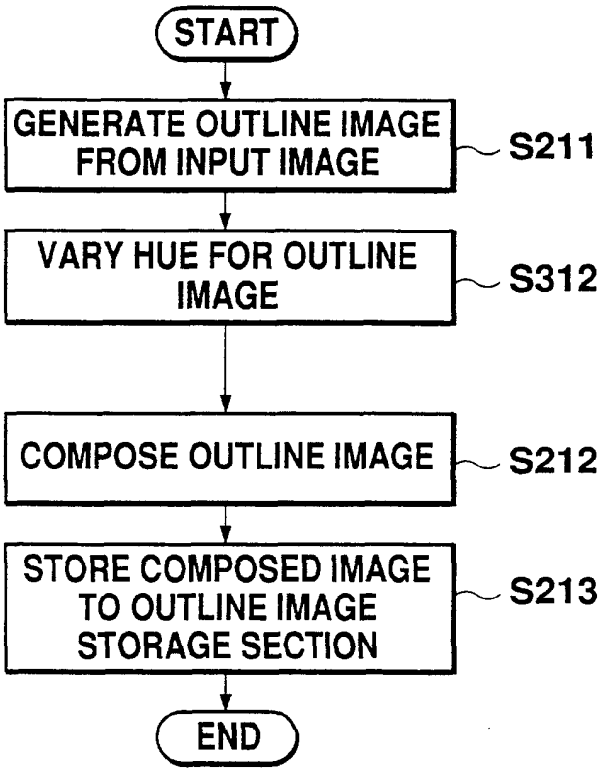
START
GENERATE OUTLINE IMAGE FROM INPUT IMAGE
S211
VARY HUE FOR OUTLINE IMAGE
S312
COMPOSE OUTLINE IMAGE
S212
STORE COMPOSED IMAGE TO OUTLINE IMAGE STORAGE SECTION
S213
END

Fig. 10

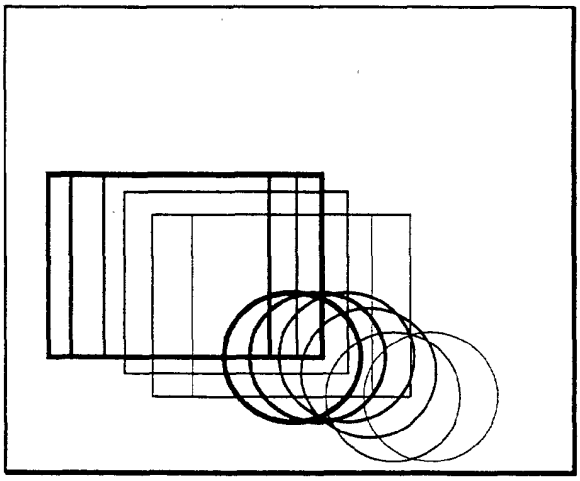

Fig. 11

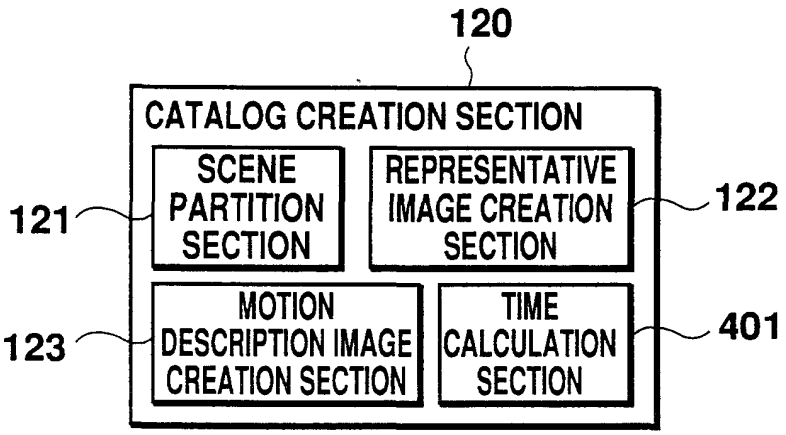
120
CATALOG CREATION SECTION
SCENE PARTITION SECTION
REPRESENTATIVE IMAGE CREATION SECTION
MOTION DESCRIPTION IMAGE CREATION SECTION
TIME CALCULATION SECTION
121
122
123
401

Fig. 12

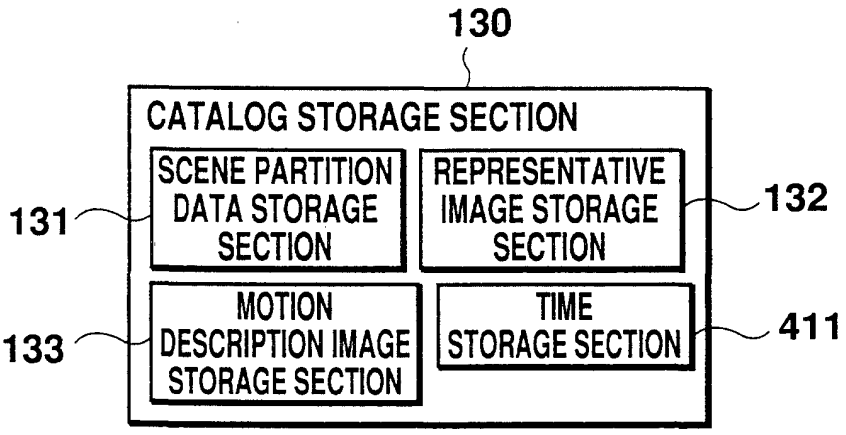
130
CATALOG STORAGE SECTION
SCENE PARTITION DATA STORAGE SECTION
REPRESENTATIVE IMAGE STORAGE SECTION
MOTION DESCRIPTION IMAGE STORAGE SECTION
TIME STORAGE SECTION
131
132
133
411

Fig. 13

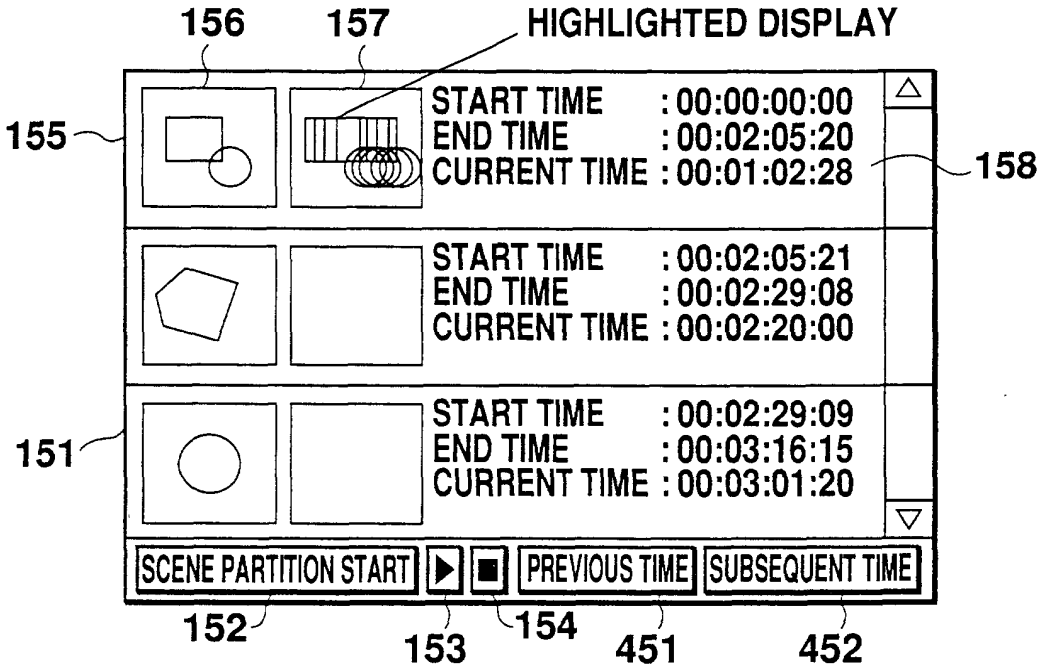
156
157
HIGHLIGHTED DISPLAY
155
START TIME : 00:00:00:00
END TIME : 00:02:05:20
CURRENT TIME : 00:01:02:28
158
START TIME : 00:02:05:21
END TIME : 00:02:29:08
CURRENT TIME : 00:02:20:00
151
START TIME : 00:02:29:09
END TIME : 00:03:16:15
CURRENT TIME : 00:03:01:20
SCENE PARTITION START
PREVIOUS TIME
SUBSEQUENT TIME
152
153
154
451
452

Fig. 14